Representation Subsystems in IOC-1

TRANSIMS Team

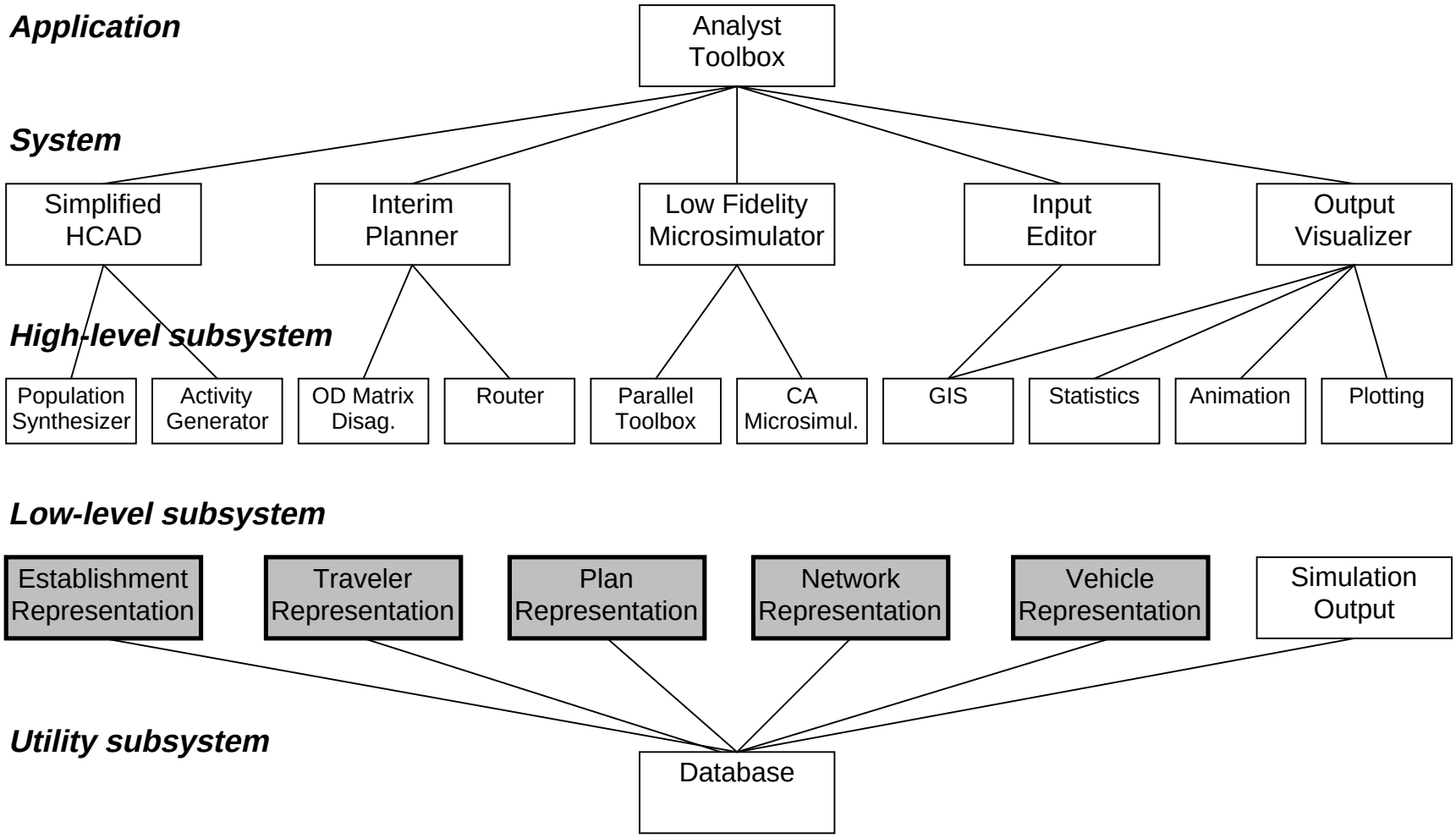
Los Alamos National Laboratory

5 April 1995

Representation Subsystems

- The representation subsystems model the basic attributes and behavior of transportation objects for the high-level subsystems and for the systems.
- They supply a common representation of objects that are used throughout TRANSIMS.
- These subsystems never interact directly with the user.
- For IOC-1, there are the following representation subsystems:
  - Establishment
  - Traveler
  - Plan
  - Network
  - Vehicle

Representation Subsystems in the TRANSIMS Architecture



Network Representation Subsystem

- The transportation network representation includes detailed information about roads, intersections, signals, sensors, transit systems, rail, bikeways and walkways. Network topology is represented along with attributes that describe the nodes and links in the network.

- Link attributes for the road network include such characteristics as link type, length, directionality, speed limit, number of lanes, special lane designators, grade, toll, passing allowed, visibility range, street name, traffic capacity, etc. Node attributes may include node type, associated intersection (if applicable), etc.

- Transit networks, associated transit schedules, and transfer facilities are not represented in IOC-1, but provision are being made to include them in a later IOC.

Establishment Representation Subsystem

- The definition of an establishment includes households, group quarters, and businesses. Each establishment possesses a unique identifier and the socioeconomic attributes required by the activity generator subsystem.

- IOC-1 does not focus on commercial activity or the movement of freight. Provisions are being made for the needs of the more sophisticated planner and disaggregator to be developed in a later IOC.

Traveler Representation Subsystem

- The traveler representation includes the demographic, socioeconomic, and geographic attributes needed for identifying travelers and for planning trips. It also includes the driver representation and driver model needed for simulating driver behavior.

- The traveler representation for IOC-1 is fairly simple. The framework developed is consistent with the future enhancements to be made in the planner and disaggregator.

Vehicle Representation Subsystem

- The vehicle representation describes the attributes of the vehicles used in the models.

- Not all potential attributes are needed for every type of study, e.g. air quality studies require dynamic information about engine properties, while other studies may not. The vehicle representation is flexible enough to support a variety of studies but not require unnecessary attributes for a particular study.

Plan Representation Subsystem

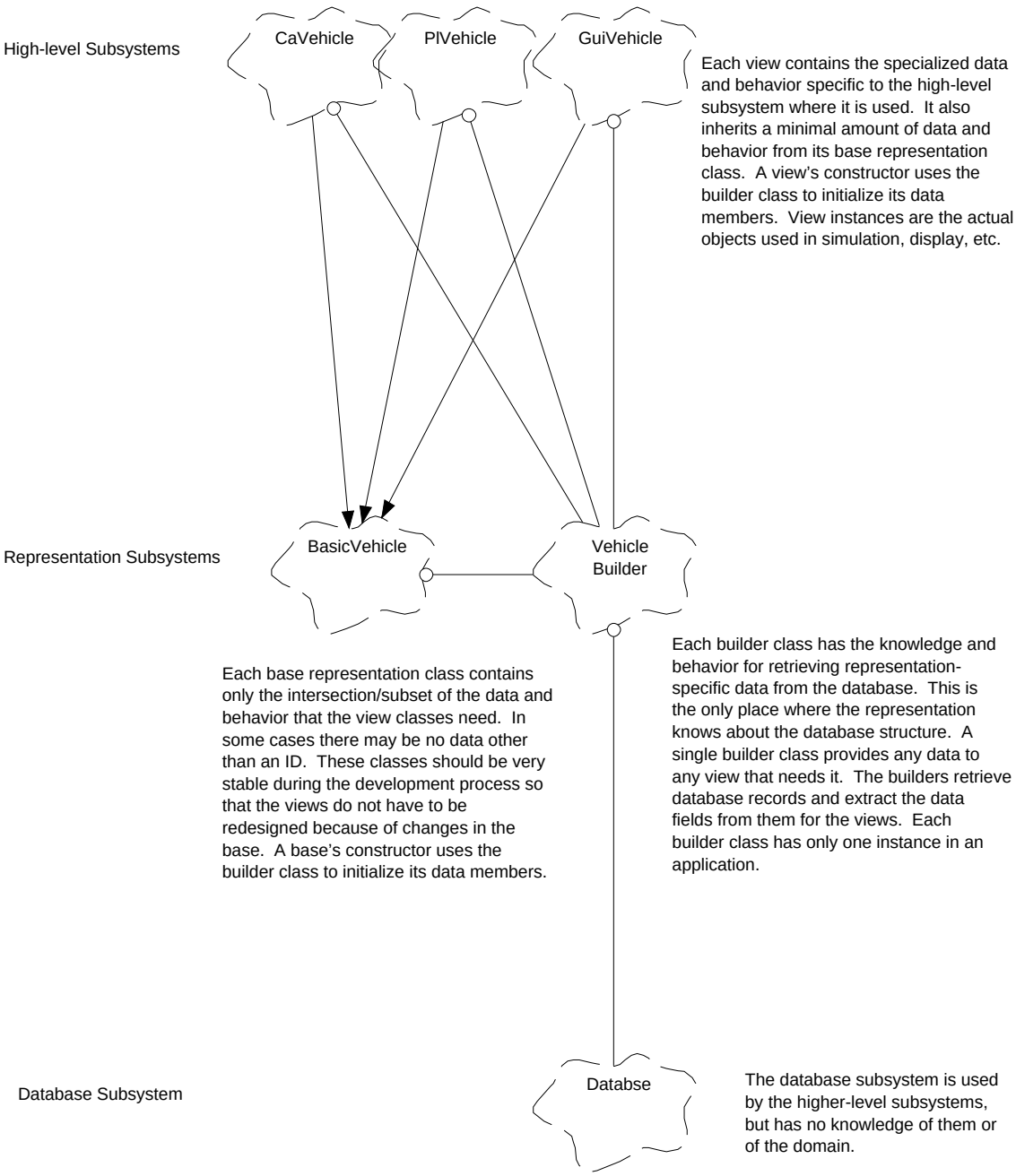
- The plan representation provides a view of trips and trip chains in the form of routes, origins, and destinations during specific time periods.

- A trip chain is a sequence of trips. A trip includes:
  - trip purpose
  - unique identifier for the traveler
  - unique identifier for a vehicle
  - starting node in the network
  - desired departure time from that starting node
  - destination node in the network
  - desired arrival time at that destination node

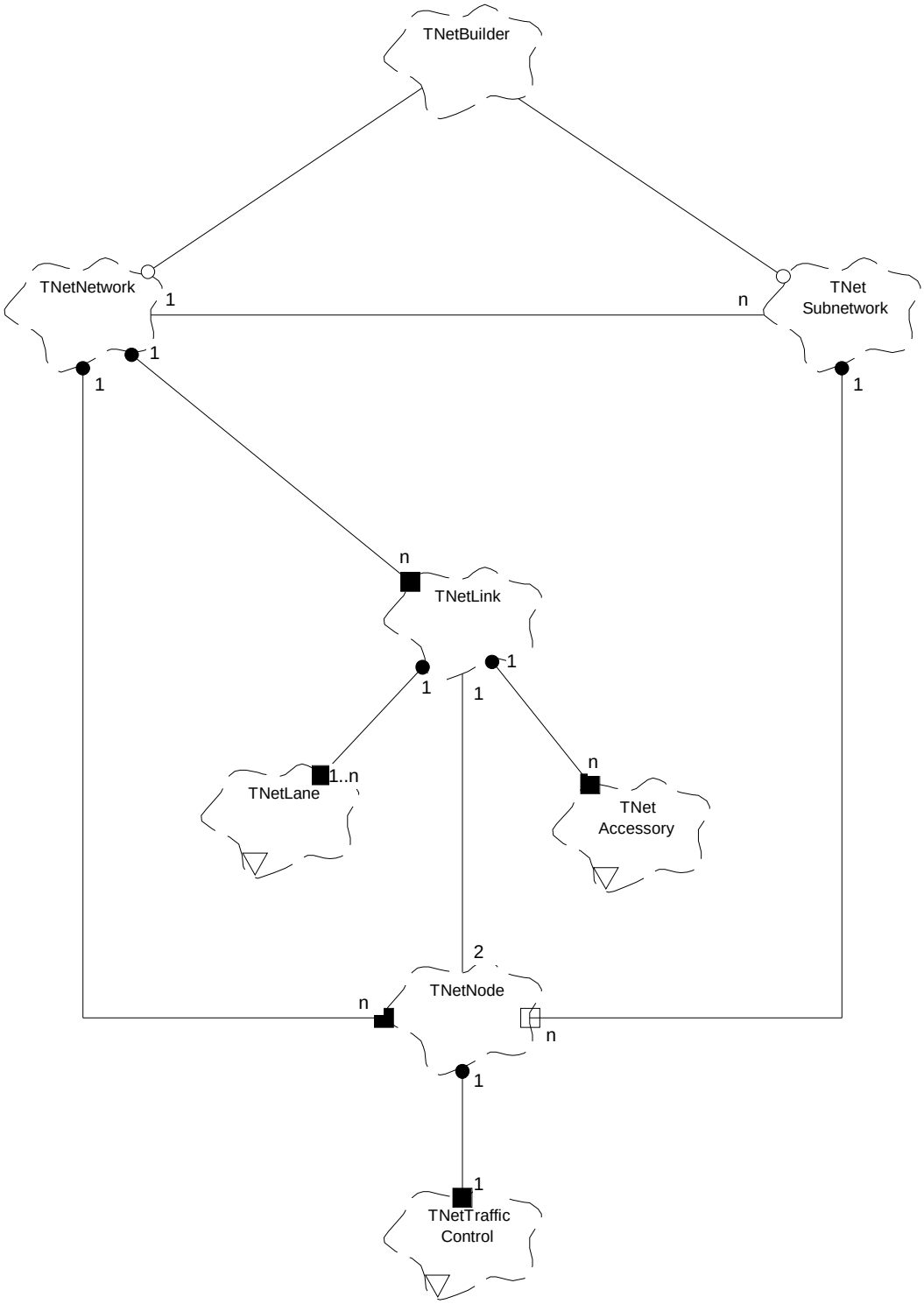
Basic Representations and Views

- Different systems and high-level software components need different "views" of the basic objects.
- The *basic representation* of an object contains the attributes and behavior that all subsystems using the object need.
- The various *views* of the object in different subsystems also contain the object's additional attributes and behavior specifically required by that subsystem.
- For example, the CA Microsimulation subsystem does not need to know the demographic characteristics of a traveler, but the Statistics subsystem probably does. It would be inefficient to carry all of the demographic information in a microsimulation, however.

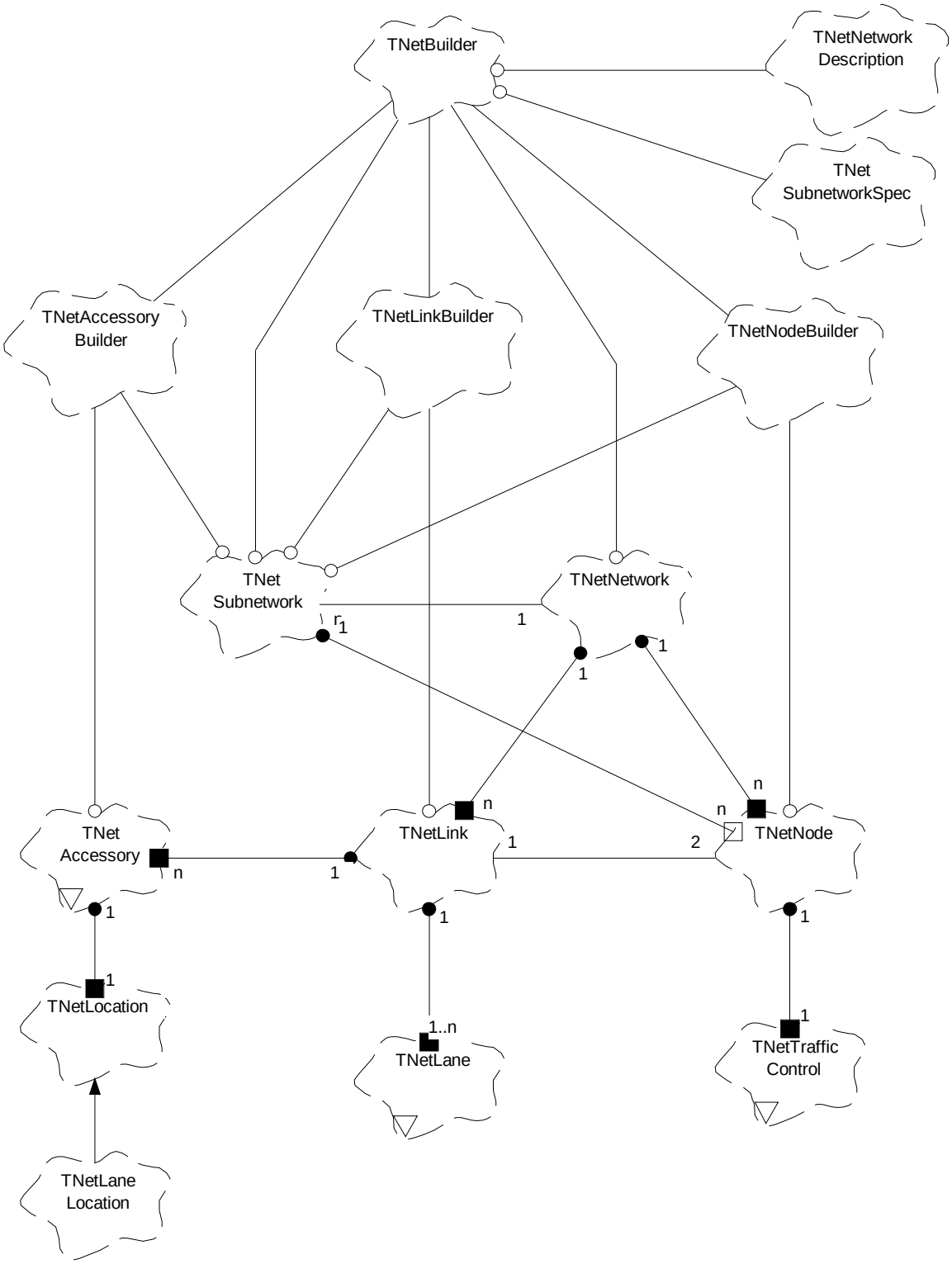
Representation/View Design



Network Representation
Top-Level External View



Network Representation
Top-Level Internal View



Conclusions

- The representation subsystems provide a common framework for dealing with traffic objects in TRANSIMS.
- The support of multiple views of an object allows flexibility and customization.
- The representations have been designed for long-term usefulness in TRANSIMS, not just for IOC-1.